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Outcome Driven Innovation in the Context of Blended Learning – A Need-Based Innovation Approach for Digitalization of Higher Education

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Abstract
Current changes in the field of digitalization increasingly affect higher education. Students’ behavior to seek, gather and process information during learning has transferred from analog to digital services. The shift from analog to digital learning patterns challenges traditional universities and offers potential market opportunities as well as risks. Especially new, disruptive technologies and business models in the field of e-learning services may yield a potential threat for traditional universities. Therefore, universities have to anticipate changes in their environment and turn them into opportunities. The traditional strategic orientation has to be adapted and a new value proposition needs to be created, which effectively targets problems and needs in learning and teaching. This Paper employ an Outcome Driven Innovation (ODI) approach as a methodological contribution to support need-based strategic orientation of a German university. The ODI methodology enables the identification and exploration of university students’ and lecturers’ needs in order to translate these into innovation potentials. The results can be used to develop a need-based digitalization strategy and digital learning solutions based on a blended learning approach.
1 INTRODUCTION

Recently, higher education is challenged by an emerging shift from traditional and analog learning approaches towards new, electronic or digital learning patterns. This shift is initiated by the digitalization of the society [14]. Students transfer their life to digital services and increasingly start to implement those structures in their learning behaviors [48].

However, digital education is not a new phenomenon. For example, American universities such as Harvard, MIT or Stanford already operate and enhance their existing online learning platforms that students can access worldwide. At the same time, new and disruptive e-learning concepts may also radically alter the way higher education is delivered. The Khan Academy offers online courses globally and free, providing education to everyone [47].

Universities from all over the world have started their own online platforms for e-learning to provide higher education globally. Harvard for example offers online graduate programs, which are also available for students globally. This transformation intensifies competition for universities as geographically separated markets now conglomerate to one. The increasing displacement from face to face lectures to online platforms leads to the reduction of geographical boarders paving the way for internationalization strategies for education and learning. Universities are no longer bound to their geographical position and can provide education globally and at lower cost [26]. This enforces competition among providers of higher education, because prior distinct markets grow together. Thus, universities that used to have limited influence on each other are now competing in a world market [15]. Digitalization and globalization of higher education challenge the traditional strategic orientation and structure of higher education institutes. This leads to both market opportunities and risks [46]. Hence, traditional universities have to reconfigure and alter their current routines in order to stay competitive and to absorb possible benefits of digitalization [22].

Universities can employ existing resources such as established IT infrastructure e.g. digital video or server capacities etc. In combination with the expertise, German universities have to offer in teaching, online platforms may pose an opportunity to expand into new markets or sizable niche markets ([4], [26]). The technological advancements in the field of e-learning have a broad applicability. Digital services offer a great flexibility for students as well as for universities to create, process and deliver knowledge and education [46]. In this regard, universities have to address new, emerging needs and problems that students now encounter during their learning processes. As a result, the emerging learning patterns and changing needs of students pose market opportunities and risks for providers of higher education [46].

Prior studies have shown that pure e-learning concepts have limited fields of application. On the one hand, students value the flexibility of e-learning courses and the possibility to get access to a broad range of information and affordable higher education [11]. On the other hand, students sense a great uncertainty and risk accompanied with online courses and its quality or its acknowledgment inside and outside the university. The perceived risk of getting false information or misinterpreting those is higher in an online environment [17]. Furthermore, social interaction between students or between students and teachers cannot be installed at a satisfactory level [37]. Thus, universities have to find a balance between traditional/analog learning concepts and e-learning methods. The concept of blended learning combines and balances e-learning and analog in-class lectures. This approach is acknowledged to be more effective than teaching methods focusing purely on analog or digital approaches [34].

Established universities are challenged to complement their current value proposition with e-learning concepts and to create a hybrid learning experience. In order to assess possible consequences resulting from digitalization, organizations like universities have to change on an institutional level. However, this demands a coherent digitalization strategy. In this regard, a strategy defines the basic direction of an organization in the future. It involves all areas of an organization such as mission, people, finances, customers etc. [32]. Finally, a strategy ought to enable business units to create value for their respective customer group [13]. The leading question throughout this study is therefore, how to evaluate and nurture the development of a strategy in times of digitalization and based on students'
and lecturers’ needs in higher education. The traditional university model has to be adapted and a new value proposition has to be created through e-learning, which effectively targets problems and needs of students in the new digital age. To do so, our research study investigates the following research question:

*How can a traditional university, in the digital transition to blended learning, assess unmet learning and teaching needs as a solid groundwork for effective technology and strategy development?*

The field of strategic marketing provides various tools to examine the formulated research question. In contrast to corporate strategy, the decision range of strategic marketing is limited to the market perspective. It mainly concerns customer relationships, products and services and does not involve organizational change [2]. In this regard, the innovation management literature provides techniques to cope with radical technological or organizational change and resource dependency. In innovation management a key factor, determining the success of new product and service solutions, is the ability to identify and address unmet needs of customers/consumers and users [7].

As universities are currently confronted with new technologies and structural change, it is crucial to explore if there are needs that correspond and are complementary to a blended learning concept. The objective of this paper is to contribute a methodological approach to identify and evaluate unmet needs within the learning and teaching process of higher education and its digitalization. In order to identify and address unmet needs of customers/consumers and users, we select and apply the Outcome-Driven Innovation® (ODI) methodology to answer our research question and accomplish our objective [40]. We organize our paper as follows: Section 2 outlines the theoretical background of our research and reviews the literature on customer centric innovation. Section 3 describes the applied research methodology and its setting. Section 4 reports the results of the study. Section 5 provides the discussion of results and methodological contribution, and Section 6 contain the conclusion of our findings. Finally, Section 7 comments on the limitations of our study and proposes further research.

## 2 THEORETICAL BACKGROUND

Traditional Universities in Germany have incumbent organizational structures, which often lack the ability to sense evolving changes in their competitive environment. Similar to incumbent enterprises, universities fail to seize the opportunities and the threats evolving from new technologies. Hence, traditional universities often fail to recognize the window of opportunity. As a result, they do not adapt their internal structures to new environmental circumstances and changed requirements [23].

Meanwhile students’ learning behavior and needs changed dramatically. The way students seek, gather and process information has transferred from analog to digital services, which makes online education even more attractive to the mainstream student [15]. Nowadays online universities have created a value proposition that attracts not only customers of higher education but the mass market as well. Compared to universities, online providers save a reasonable amount of money. They do not need to maintain a campus infrastructure, have no summer break and therefore a continuous revenue stream; they do not fund sports teams or research projects. These online educators develop online courses and learning analytic programs, which support students with difficulties. Online education can provide both low costs and high quality, making the concept to a threatening innovation with disruptive potential for traditional universities worldwide. Therefore, it is crucial for universities to anticipate the changes in their market and adapt their current strategy according to the new requirements [15].

The concept of blended learning provides a valuable approach to manage the transformation from analog to digital education policy. The combination of both traditional/analog and digital/disruptive teaching concepts provides a flexible system that has the potential to serve different student segments at the same time [34]. However, universities still struggle to implement new learning technologies into their organizational structure and teaching portfolio. Little research has been conducted to evaluate the usefulness of digital learning concepts like MOOCS or flipped classroom etc. and whether these formats generate a real added value to a student’s learning process. In order to create a balance between semiformal e-learning services and traditional, more formal teaching methods universities have to evaluate at what point one concept outperforms the other ([15]; [34]; [46]).

Universities in Germany are state funded and have limited resources to experiment with e-learning technologies. Investments in new technical solutions have to be well planned and proceeded. Hence, universities aim to gather a set of assessment criteria as a first step. One valuable source of information is the students’ and lecturer’ perspective. In this sense, students are the customers of the university and blended learning ought to support students in their academic training as a new value
proposition. Exploring their learning patterns and their needs during the learning process enables universities to find attractive fields of application for e-learning technologies and services [17]. In addition, universities can identify weaknesses in their current offering and internal structures of teaching lecturing, which represent fields of opportunities. Need-based changes affect the value proposition and the delivery of value for student as customers and lecturers as contributors, but might create a competitive advantage for established universities [47].

Therefore, Porter [32] is advocating a need-based positioning of organizations and companies, where customer segments with distinct needs are targeted. Finally, organizations have to take a view from a customer’s perspective and identify which jobs customers want to get done and which products they hire to do so [7]. Anthony W. Ulwick [40] has further developed this outcome-based view to the Outcome-Driven Innovation® (ODI) method, which considers customer needs as the key resource in the innovation process. ODI is an innovation methodology capturing customer insights as well as discovering overserved and underserved customer needs. Organizations can then build their strategy upon identified, unmet needs, why the ODI methodology is best suitable to [45].

So far, research has missed to examine the needs/problems of students and university lecturers concerning the digitalization of higher education [46]. Therefore, two studies were conducted, both focusing on the needs and problems of university students and lecturers. In each study, we employed the ODI approach. First, in a qualitative study we obtained the customer value model and the metrics used to evaluate the learning and teaching process as a job. Afterwards, we validated the findings using a greater scope. In a quantitative study, the identified set of customer needs were evaluated by converting these into quantifiable outcomes statements, which increase objectivity of the results. The outcomes statements, as results to improve the learning experience, are employed for strategy formulation and product development [45].

Therefore, our study has two objectives: First, aim to examine and identify needs and problems of students and lecturers within the learning process. This information is valuable in order to nurture internal new product development processes at RWTH Aachen University and its product innovation strategy. Secondly, we aim to test an innovation approach for its applicability regarding need-based strategy development in the field of blended learning. For that reason, we employed the ODI approach as a methodological contribution to uncover basic and latent needs within the learning and teaching process of higher education.

3 OUTCOME DRIVEN INNOVATION METHODOLOGY

3.1 Methodological approach and setting

The purpose of our research is to gain a deep understanding of the needs and problems students as well as university lecturers encounter during the academic process of learning and teaching. To provide holistic and unbiased results, an exploratory research design was applied. Our paper employ the Outcome Driven Innovation approach as methodological setting, because it provides a systematic and objective procedure to uncover latent customer needs [42]. The ODI method is a holistic innovation approach that focuses on the job-to-be-done logic by Christensen [8]. Customers employ products or technological solutions to receive a certain outcome or goal. To evaluate a product or a solution, a set of metrics is applied to measure how effectively a product or service can contribute to the degree of job achievement [43]. A job is defined as a problem a customer or user encounters in a given situation or a need that has to be satisfied. Customers evaluate products and services based on how well they help to get the underlying job done. Therefore, companies ought to gain a deep understanding of the core jobs their products have to support and how customer measure the successful or failed job execution [8]. The ODI approach focuses on uncovering the metrics customers apply to evaluate solutions and aims to convert them into measurable items. So far, the method is mainly used for the development of new products and services. However, as the method enables to transform fuzzy needs into measurable outcomes, the ODI approach may be suitable to enrich strategy formulation regarding digitalization of higher education [48].

The RWTH Aachen University (RWTH) was chosen as study object. The university is one of the leading German research universities with more than 43,000 enrolled students [10]. The higher education system of Germany differs from international universities like in the US. German universities are highly funded and tuition fees are rather low respectively do not exist. Therefore, German
universities may not be threatened by disruptive e-learning concepts in the short term but in the long run when students’ behavior and needs change and international competition among universities increase. Therefore, traditional and still successful German universities like RWTH have to adapt to environmental changes caused by digitalization of education. So far, RWTH lacks a coherent strategy to deal with digitalization. Each faculty can experiment with e-learning products or services and develop a digitalization strategy for themselves. However, this leads to redundant experiments, resource wastefulness and to incoherent digitalization strategies throughout the research institutes [28]. A coherent and holistic strategy is very important for the overall performance of an incumbent organization, which is confronted with future disruptive change [20].

Hence, by exploring the needs and problems students encounter, RWTH aims to develop a holistic digitalization strategy, on which different faculties can build upon. To further enhance the digitalization strategy, also university lecturers or employees involved in teaching are taken into consideration as important stakeholder (e.g. professor, assistant professors, Ph.D. candidates etc.). This is mainly due to the special role of professors and lecturers in the value creation and delivering of generated e-learning concepts and content. They are one determinant in the diffusion of new learning concepts, as they have to adopt a lot of concepts before students get the chance to. Eyring and Christensen [15] state that preserving individual commitment of professors while structurally changing fundamental elements of the university necessitates an equally high level of commitment from the institutional level. Otherwise, some stakeholders might behave defensively or even opportunistically against necessary change. A clear understanding of needs, which professors and faculty staff experience throughout the semester can enrich the strategy formulation, as it may facilitate and accelerate organizational change. In addition, they can be seen as experts in terms of student problems and needs, but also in judging the pedagogic value of new e-learning technologies [15].

The ODI approach uses traditional customer-orientated research techniques but alters the perspective in order to overcome structural flaws of most other market research methods. Therefore, we separated our research approach into two steps. In a first step, we conducted qualitative research by using structured interviews. Using in-depths interviews the job as well as customers’ latent needs concerning the learning and teaching process are explored [43]. Despite the focus on customer needs, special emphasis is given to the analysis of opportunities, so called important and unsatisfied needs or problem fields within the learning process. The second step contains a large-scale validation survey, where we gathered and analyzed quantitative data using ODI specific heuristics [40].

3.2 Data collection and analysis using Outcome Driven Innovation

The study was conducted at the RWTH Aachen University located in Germany as a longitudinal case study within the research project “AIX Future Teaching and Learning” funded by the “Donors’ association for the promotion of humanities and sciences in Germany”. The objectives of this research demand an exploratory research design. Thus, a mixed method approach based on the ODI proceeding is employed, as it is best suited to explore a (emerging) phenomenon. A qualitative study is conducted in order to explore the customer value model of the respective stakeholder group. We then validated the findings in a quantitative study [9].

Our research applies a one-year longitudinal single in-depth case study of a leading German university, which has a pioneering role regarding digitalization of higher education in Germany. Longitudinal case studies are suitable in the context of the development and implementation of new methods and practices ([27]; [35]). In order to ensure a great variety of needs and problems regarding the learning process of students, a purposive sampling strategy was best suited for the selection of interview partners. A purposive sampling strategy enables the researcher to choose participants based on their environment and personal traits [5].

First step of qualitative interview study. In the qualitative part of the ODI study 45 students were interviewed and these interviews were recorded and transcribed. A semi-structured Interview guideline leads the qualitative research part with a pre-defined question sheet. The guideline for the interviews follows the learning process, facilitating the interview for the respondents. They were free and unbiased in their way to answer and were encouraged to add new input. Interviewees involved many different students from all faculties, such as bachelor students, master students, working students, students with learning difficulties, commuting students and students with children. To cover different fields of study, participants had a different study background, including social science, engineering, natural science and medicine. Based on these assumptions, the sample consisted of 17 female and 28 male students enrolled at the RWTH with an age between 20 and 30 years. 18 students were
enrolled in a bachelor course, 21 participants of a master degree and 6 participants would end their academic education with a state examination. Analog to the study of students, we adopted a purposive sampling strategy in the study focusing on lecturers’ needs. Therefore, we choose lecturers from all faculties based on their experience in teaching, attitudes towards new teaching approaches, size of chair etc. Based on these criteria 34 participants were interviewed. 32% of the participants were female and 68% male, reflecting the gender distribution among RWTH lecturers in a representative way [10].

In the qualitative process step, special emphasis is given to the extraction of needs. In order to receive sufficient student inputs, which are representing the customer needs, three categories of information are required. At first, the jobs need to be identified. Secondly, the outcomes students are trying to accomplish have to be clarified, which is followed by potential constraints and problems from using any new service or product. [1] In general, customers or users experience great difficulties to express their needs and thus require help in this process [18]. One concept to facilitate the exploration of customer needs is job mapping and clustering the interview transcripts according to need and problem categories. This method decomposes a job and divides it into discrete process steps with underlying outcome cluster. In each of the steps, customers experience different problems and needs that may yield possible innovation potentials [1].

To close the gap between need and measurement of success, a direction and the unit of measure (e.g. minimize the time, increase the quality, reduce the risk or likelihood etc.) has to be identified. These metrics are mainly based on personal expenditures (time, effort etc.), perceived stability (uncertainty/risk, likelihood etc.) and generated output (effectiveness, efficiency, information etc.), which are captured from the customers free from any given technical solution [45]. After describing a desired outcome (e.g. flexibly rework a lecture for my own), a full outcome statement can be built, which follows a certain structure [45].

Once the need-based value model is derived, the obtained data has to be prepared for the quantitative study. In general, one interview generates between 50-150 outcome statements, which necessitates a sample between 10 to 15 interviews to extract the majority of needs in a certain investigated field [19]. These we categorized and aggregated in order to reduce the complexity and eliminate redundancies in the qualitative data. In a next step, we screened the reduced set of relevant statements and we identified the most important ones. The evaluation of the statements is based on the frequency of a relevant statement as well as on its distinctiveness for the innovation process. The set of highly important outcome statements are used for the quantitative research and called panel statements. We also subsumed similar outcome statements to one panel statement [40]. Based on the data of the structured in-depths interviews, we selected and used a set of 36 panel statements for the student ODI. The qualitative research conducted with lecturers resulted in 43 needs for a quantitative survey.

Second step of quantitative validation. In the previous step, jobs, outcome statements and potential constraints/problems have been determined. Therefore, the aim of the next step is to prioritize those and as a result to unveil the most promising ones among all identified jobs, outcomes and potential constraints [45]. Ulwick [40] defines an underserved need (job, desired outcome and potential constraint) as an opportunity. More specifically, the opportunity is the result of a need, which is important to the customer, but where the customer is not satisfied with the current solution [45]. In the following online survey, we evaluated each panel statement based on two factors: importance and satisfaction. Both dimensions are surveyed using a 5-point Likert scale. Despite the relevant panel statements, both surveys included demographic data as well as questions concerning learning and teaching behaviors. Both studies were online surveys and distributed using official channels of the RWTH. After data cleaning, we used 3489 observations as an input for the student ODI and 268 observations were selected for the ODI of the lecturers and people involved in teaching. The rate of return was 8% of the basic population for both studies and representative according to the university key data [10].

The ODI method provides two instruments to analyze the data obtained: opportunity map and opportunity score. For both tools importance and satisfaction scores are needed. The importance and satisfaction scores used for this calculation are the relative share of observations that have evaluated a panel statement with 4 (very important/satisfied) or 5 (extremely important/satisfied). For example, if 83% of the respondents use a 4 or 5 to evaluate the importance and 42% of the respondents rated satisfaction with 4 or 5 of a panel statement, then the respective score for importance is 8,3 and for satisfaction 4,2 [40].
In a next step, we generated the so called opportunity map, which provides a graphical overview of the data and the respective innovation potential of the panel statements. The panel statements are depicted in a two-dimensional space, where the axis of abscissae describes the importance of the respective panel statement and the axis of ordinates refers to the satisfaction level. This spans an opportunity space that categorizes the panel statements into three categories: over-served, appropriately served and under-served needs (see Fig. 1).

Figure 1. Opportunity Map divided into three main areas (Students’ ODI left; Lecturer’s ODI right)

Over-served panel statements are those needs where the satisfaction score exceeds the respective importance score of a need. As customers do not consider the need as important to get a job done, organizations should not waste resources on needs in this section. In this area, companies can screen the market for cost reductions or for potential disruptive innovations. Panel statements that are balanced in terms of importance and satisfaction can be categorized as appropriately served. Spending more resources to increase the satisfaction level would be wasteful. However, needs that are on the verge to the underserved area, need further evaluation. Because in this area needs are located, which are poorly addressed by current products and services. Therefore, the panel statements in this sector yield innovation potentials for organizations [1]. Whereas the opportunity map is a graphical evaluation tool, we employ the opportunity score to derive a hierarchy of needs. The opportunity score helps to quantify the innovation potential of each panel statement, which enables a comparison of these. The score results from a simple mathematic equation: Opportunity Score = Importance + max [Importance - Satisfaction]. For one panel statement for instance, 83% of the respondents rated importance and 42% of the respondents rated satisfaction with a scale of 4 or 5. This results in an opportunity score of (8.3+(8.3-4.2)) = 12.4 [40].

The opportunity scores can lie within a continuum of 0 and 20. A score of more than 10 defines an opportunity for innovation. Opportunities above 12 are considered to have a high innovation potential. Scores above 15 have an extraordinary potential for innovation. All scores below can be neglected at that point. Those needs are either appropriately served and therefore do not require any resources or are too unimportant and even offer possibilities to reduce costs [40]. After being able to measure the score for an opportunity in a quantitative survey, organizations are able to identify unmet needs directly, as well as prioritize these needs by creating an opportunity landscape [39].

4 RESULTS

4.1 Results Study 1: Students ODI

The results from 45 in-depths interviews show that students are looking for ways to update their learning process with new digital learning tools and they appreciate the flexibility of digital media. However, students also value traditional teaching concepts and face-to-face learning with a lecturer, which is perceived as more fun and more credible. Therefore, e-learning solution may best be suited to facilitate organization/administration and execution of learning activities, but cannot substitute traditional learning interactions at all. We converted the results from the qualitative interviews into need statements, so called outcome statements, and finally subsumed to panel statements.

In total we inserted 36 panel statements into a quantitative survey and these were evaluated regarding their importance and their level of satisfaction. In Fig. 4 the left opportunity map depicts the ODI results from RWTH students, which is a descriptive instrument to provide a first overview. The
opportunity map reveals several unmet needs that can be addressed using e-learning technologies. It also depicts that many identified needs are served appropriately and thus need no further examination. Only two panel statements are over-served. In total 14 under-served needs were identified in the learning process of students, which pose high innovation potentials. These are not appropriately addressed in academic teaching of the investigated student population, which leaves sufficient room for improvement and innovation.

However, this is only a graphical analysis. The quantitative opportunity score is a more profound and sophisticated index in order to assess the innovation potential evolving from outcome statements [40]. Therefore, we used the opportunity equation to rank each panel statement according to the opportunity score. Based on the characteristics of the opportunities we derived four need-based clusters:

**Table 1 Identified need-based clusters of student ODI**

<table>
<thead>
<tr>
<th>Opportunity Cluster</th>
<th>Nr.</th>
<th>Panel Statement</th>
<th>OPP Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encouragement and support during learning</td>
<td>34</td>
<td>Reduce the risk of not being able to solve an exercise on my own.</td>
<td>12,5</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>Maximize the number of achievement/success experiences during learning processes.</td>
<td>12,2</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Maximize the number of opportunities to get direct feedback on e-learning exercises.</td>
<td>10,6</td>
</tr>
<tr>
<td>Sureness while organizing the learning process</td>
<td>26</td>
<td>Minimize the likelihood that my personal time management during learning does not work.</td>
<td>12,4</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>Reduce the effort to plan the semester.</td>
<td>11,5</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>Reduce the insecurity of getting incorrect information.</td>
<td>10,8</td>
</tr>
<tr>
<td>Availability of learning materials and information</td>
<td>3</td>
<td>Maximize the likelihood that literature is free, flexible and online available.</td>
<td>13,8</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>Minimize the amount of missing learning material.</td>
<td>13,2</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>Reduce the effort to obtain additional information of a lecture (e.g. additional examples, further explanations, application tasks etc.).</td>
<td>11,7</td>
</tr>
<tr>
<td></td>
<td>27</td>
<td>Reduce the effort to find certain information and content using e-learning (e.g. in study portals or platforms etc.).</td>
<td>10,8</td>
</tr>
<tr>
<td>Pragmatism of learning</td>
<td>7</td>
<td>Increase the flexibility to rework lectures individually (e.g. from home).</td>
<td>13,3</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Increase the graphicness and clearness of course content to improve the understandability.</td>
<td>13,1</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>Maximize the number of exercises with practical orientation.</td>
<td>11,7</td>
</tr>
<tr>
<td></td>
<td>28</td>
<td>Increase the fun factor of learning (e.g. in lectures).</td>
<td>10,7</td>
</tr>
</tbody>
</table>

From a students’ perspective, the current learning concept lacks a satisfactory level of encouragement and support, why a certain degree of security within the learning process is missing. This refers to sureness about learning content and the organization of individual learning processes. Therefore, the first two clusters of identified higher education opportunities at RWTH relate to encouragement and support during learning as well as sureness while organizing the learning process. A students’ orientated solution of these two clusters should reduce uncertainty and organization efforts within the learning process. In addition, students evaluate the availability of learning materials and information provided by the university as an important and unsatisfied need. This involves the increased access to literature and information and the reduced effort to find relevant literature or information by using an e-learning platform. Furthermore, it is important that learning materials are consistent and steadily provided in order to reduce the possibility of missing materials. Finally, students at RWTH are looking for a higher degree of pragmatism of academic learning in terms of higher flexibility, fun, graphicness/descriptiveness and increased practical orientation. This pragmatism should increase the motivation regarding their studies by building on more practice orientated approaches, which prepare students for their future profession.

Overall, the results show that students at RWTH want to focus on efficient learning instead of being distracted with planning and preparing of their learning activities. Furthermore, the results show that RWTH students are highly focused on pragmatism in achieving their academic degree. This suggests that the underlying job of academic teaching is to qualify efficiently students for their future profession. This indicates a strong focus on pragmatic learning which becomes apparent in panel statement 18 (see Table 1).

However, students differ in terms of experience and attitudes according to academic education. The research fields are rather divers, why the faculty cultures and teaching styles differ, which makes the
overall population of students at RWTH heterogeneous. Nevertheless, the ODI evaluation reveals four homogeneous clusters of common need-based opportunities within the surveyed population of RWTH students. As an overall result, the ODI study identified several key components, which can be used to define a holistic strategic conceptualization in times of digitalization of higher education.

4.2 Results Study 2: Lecturers ODI

The main focus of this study is to uncover basic and latent needs of lecturers or employees involved in teaching. The findings ought to nurture the digitalization strategy of RWTH. The qualitative interviews show that lecturers influence the learning experience of students. In this sense, lecturers are enabler of digital change, as they have to adopt digital media and methods to their teaching concepts in the first place. Due to the special role of this stakeholder group in the diffusion of e-learning services, universities may accelerate the change process by addressing the needs of lecturers, too. The results from both studies can then be aligned in a holistic strategy. Analog to the first ODI study, we conducted qualitative interviews to identify the needs of professors and other lecturers. Therefore, we interviewed 34 lecturers from different faculties about their teaching needs, problems and patterns. In general, it becomes apparent that faculties differ in their evaluation about e-learning services. Whereas some faculties already experiment with e-learning, other faculties are reluctant to deviate from traditional face-to-face teaching approaches. In total, we identified 43 needs in the qualitative research and used these for the quantitative evaluation. In Fig. 4 the right opportunity map depicts the ODI results of the university lecturers. The opportunity map shows a low satisfaction regarding the identified needs to facilitate teaching for this stakeholder group. We identified 8 under-served needs. Only one need is located in the over-served area of the opportunity map. Most of the other panel statements are evaluated as appropriately served and thus need no further action. We categorized the under-served needs into four opportunity clusters (see Table 2):

<table>
<thead>
<tr>
<th>Opportunity Cluster</th>
<th>Nr.</th>
<th>Panel Statement</th>
<th>OPP Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encouragement of an continuous learning processes</td>
<td>23</td>
<td>Increase the likelihood that students prepare and rework course content independently.</td>
<td>16.9</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>Increase the likelihood that students engage in continuous learning processes.</td>
<td>14.6</td>
</tr>
<tr>
<td></td>
<td>39</td>
<td>Reduce the likelihood that students are not intrinsically motivated to study for a lecture and rather learn to achieve a certain grade result (e.g. learn only to pass an exam etc.).</td>
<td>14.1</td>
</tr>
<tr>
<td>Scientific writing</td>
<td>40</td>
<td>Increase the possibility for students to learn academic/scientific writing.</td>
<td>12.7</td>
</tr>
<tr>
<td>Sureness while using e-learning in teaching</td>
<td>26</td>
<td>Reduce the likelihood of infringements of copyrights when using e-learning formats.</td>
<td>12.4</td>
</tr>
<tr>
<td></td>
<td>33</td>
<td>Minimize the opportunity to cheat in electronic exams.</td>
<td>10.6</td>
</tr>
<tr>
<td>Organizational effort</td>
<td>12</td>
<td>Reduce the time effort related to bureaucratic processes when setting up a new course.</td>
<td>14.7</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>Reduce the time effort to become familiar with new e-learning technologies and their application areas.</td>
<td>11.3</td>
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First, lecturers want students to engage in continuous learning processes and encourage students to be prepared for their lectures, to interact in class and discuss the learning content. Secondly, needs refer to the teaching of academic skills to students. University lecturers have a great focus on scientific methods and want to pass on these skills to students. Thirdly, the insecurity related to e-learning services was stated from professors and teaching assistants. Lecturers perceive various risks concerning e-learning, for example they sense legal risks such as copyright violations. Finally, innovation potentials also refer to the administration and organization of lectures. Most teaching staffs are challenged with the bureaucracy and the time consuming administrative work when setting up or operate a lecture.

The results indicate that lecturers lack competencies to work with e-learning services. They question the pedagogic value of pure e-learning concepts and state that tradition face-to-face concepts are not substitutable in some fields. However, e-learning may pose some solutions to currently under-served needs: It can be suitable to reduce the bureaucratic and organizational efforts for lectures and help to foster continuous learning of students. This need also supports the assumption that lecturers want to interact with students and to discuss the learning content in a dynamic but reliable teaching environment.
5 DISCUSSION

5.1 Discussion of Results

The research objective of our study is to uncover unmet needs in academic learning and teaching of higher education. Based on the identification of underserved needs, so called opportunities, RWTH Aachen University is able to develop a strategy to target the digitalization of higher education [44]. The identified opportunities are taken as a foundation to design a blended learning strategy merging digital and analog concepts. In conclusion, the results from both studies (students and lecturers) are consolidated and three common action points to create a holistic blended learning strategy are derived (see Fig. 2):

![Fig 2. Need-based blended learning strategy](image)

The results of the ODI suggest that students are efficiency-driven and that e-learning can support the organization of their learning process. From a lecturer perspective, the effort to organize academic teaching is perceived as too high and ought to be reduced in order to focus more on the teaching and interaction with students. Still, a great focus on face-to-face lectures can be validated in both studies. Therefore, a key action point is to establish a digital system or platform for interactive support and encouragement. Furthermore, incentives and motivation is a central element accomplished by e-learning and more pragmatic concepts, which upgrade the time consuming learning and teaching processes. As a third key strategic action point, RWTH need to establish a high degree of sureness within the learning and teaching process to reduce information asymmetries and technological risks of e-learning solution.

However, our study identified two areas of tensions as well. First, the perception regarding the job of students and lecturers diverge in terms of learning and teaching focus. Lecturers are concerned to provide learning content constantly in order to foster a continuous learning process over the whole semester. In contrast, students rather focus on the necessary content for their exams and its prerequisites to pass successfully. In addition, Students’ and lecturers’ needs heavily differ in terms of research focus. On the one hand, lecturers seek to teach students how to work academically or enhance their theoretical and scientific method skills. On the other hand, students are looking for courses that are more practical orientated and they emphasize pragmatism. The discrepancies between the two stakeholder groups may be ascribed to different jobs assigned to higher education. The results of the ODI study confirm that students attain universities as a basis to qualify for the labor market, while universities and its personnel focus on scientific research. Although these concepts may seem arbitrary to each other, a need-based blended learning strategy can help to merge and foster both approaches in times of digitalization.

The concept of blended learning provides a valuable approach to manage the transformation from analog to digital education as it can be regarded as mediator between humans and technology. The combination of both traditional and digital teaching concepts provides a flexible platform that has the potential to serve different segments at the same time. However, universities still struggle to implement new technologies and novel concepts into their established teaching portfolio and organizational structures. In order to create a balance between novel e-learning services and traditional teaching methods, universities have to evaluate when which concept outperforms the other.
On grounds of limited resources to experiment with e-learning devices, investments in new technical solutions have to be well planned. The ODI and its results can contribute to this issue by evaluating the effectiveness of blended learning tools like MOOCS, flipped classroom formats etc. from the user perspective.

5.2 Discussion of Methodological Contribution

The results of the ODI study show that the output can be used to strategically evaluate decision alternatives and to effectively allocate resources. The findings further show that the quantitative validation of each need is a valuable instrument to communicate the urgency of organizational change ([40]; [6]). This meets the three defined objectives of strategy according to Doyle [13]:

Managing the business portfolio. The results of the ODI study can be further processed in many ways: An organization can enrich their segmentation analysis with identified clusters in the ODI data. Ulwick [41] suggests starting with opportunities that have a general validity. One benefit using common opportunities is the ability to create a platform and to build up specific opportunities on this platform [41]. Afterwards underserved needs of special clusters may yield further market chances for organizations that can be served with individual products or services ([25]). Segmenting a market/population breaks down the heterogeneity of the market into homogeneous market segments ([12], [24]). Kotler [25] suggests that after a survey is conducted where customer insights are captured, a factor and cluster analysis should be executed to receive distinct segments. The ODI data can be employed to extract these segments of distinct needs. Using an outcome-based segmentation approach enables organization to uncover effectively different jobs and customer groups with distinct problems.

In contrast to private commercial companies, such as online e-learning providers, universities in Germany cannot devote their innovation efforts to only one highly attractive segment and neglecting other groups of students and lecturers. Thus, RWTH has to cope with the diversity of their students and adapt the digitalization strategies to diverse learning patterns. However, within our ODI study, not all of the investigated students and lectures evaluated the same outcomes as underserved, so that different segments of students and lectures are present within the investigated population. For the objective of our study, an outcome-based segmentation can identify groups of students or lecturers with higher or more underserved needs. Thus, information about unmet needs within the learning process can reach from a highly aggregated level to a deep and granular degree of insights.

Additionally, Brook & Pagnanelli [3] have noticed the benefits of a project portfolio for innovation projects in new product development (NPD). According to the authors, strategic decisions concerning portfolio management have to be considered in innovation projects, too. Thus, it is crucial to consider current business portfolio characteristics when defining an innovation strategy. The ODI data can be used to meet both objectives in portfolio management: The ODI data screens the market and helps to understand how existing products assists in getting a job done [43]. The categorization of needs in over- under- and appropriately served needs helps to evaluate the current business portfolio as it reveals strengths and weaknesses of it. Despite the evaluation of the existing portfolio from a customer’s perspective, the ODI data are suitable to define future NPD project. The opportunity score enables organizations not only to uncover potential innovation projects but also to rank innovation potentials. This information can be used to prioritize existing and future innovation projects (e.g. innovation roadmaps).

Hence, RWTH can leverage new products and services to students and lectures in a longer term by developing new ideas for its teaching portfolio, which meet the identified needs and its blended learning strategy [40].

Management of scarce resources. Portfolio management of innovation projects is not only important to maintain a balanced business portfolio in the future, but to manage scarce resources in the innovation process. Many organizations struggle with the allocation of financial resources to innovations in order to create value in the future [33]. Studies have shown that 3 out of 4 successful innovations have been developed based on customer input instead of a technological or strategic opportunity. Hence, it is crucial to gain an accurate understanding of the users’ needs and problems at an early stage of the innovation and NPD process. The corresponding need information can then be used as input for ideation activities. Also, these information can be used to complement strategic assessment of NPD investments by customer-oriented evaluation criteria [30].
In this regard, Ulwick [44] has highlighted an approach of prioritizing development projects by the organization’s benefit and value created for the customer. Projects and initiatives in the NPD portfolio have to be prioritized according to the fulfillment of underserved needs, which have not been served with the existing products & solutions. Therefore, adding user-based assessment criteria to screen and evaluate different idea concepts improves the overall innovative performance and increases transparency of innovation processes [44]. Based on the results of the ODI, a higher education organization like RWTH is able to deliver new successful technologies, products, getting market share and value as well as reducing development cost for their future blended learning concept. RWTH is now capable to invest in the development of blended learning solutions, which really address the needs within the learning process and generate a real benefit for its user [44].

**Foster organizational change.** Despite providing strategic assessment criteria, the ODI data can be used to accelerate organizational change. The combination of the opportunity score and map provides a simple communication package that can be employed to communicate customer insights and the strategic implications derived from those to a broad audience of stakeholders. The communication of a need-based and validated strategy can reduce organizational inertia by receiving full commitment and acceptance from central stakeholder for digital change ([23], [29]). Especially the simplicity and the graphicness facilitate the communication and accentuate the need for organizational change [43]. For providers of higher education the results can be used to identify current weaknesses in organizational structures that lead to underperforming products and services. Hence, the RWTH has to alter their organizational structures in order to meet students’ needs. However, the results also depict that blended-learning is best suited to manage the transition from analog to digital education, as it is likely to receive full commitment and acceptance from central stakeholders such as teaching personnel.

### 6 CONCLUSION

Our paper contributes a methodical approach to assist incumbent organizations like universities with a structured process to identify needs and the job-to-be-done within the learning and teaching process of digitalized higher education. Traditional universities like RWTH are challenged by new and disruptive technologies in the field of e-learning. Online providers of higher education increasingly start to dilute the current competitive advantages of traditional universities in Germany. This is mainly due to the advantages of e-learning services have in providing customer oriented flexibility of learning as well as customized learning content linked to increasing credibility and acknowledgement of their program quality [49]. Therefore, it is crucial for established universities such as RWTH to reconfigure their current organization and strategy in order to react to the changing environment of the education sector in the digital age. In line with the propositions and implications of resource dependency theory, we applied the Outcome-Driven Innovation® (ODI) methodology to support the digital transformation of RWTH Aachen University. The ODI approach is a systemized innovation approach that enables organizations to gain a deep and validated understanding of customer needs and problems, in order to develop need-based and effective strategies and solution/products [42].

The purpose of this study was to identify distinct learning and teaching needs and problems in a qualitative way and evaluate these needs quantitatively. In times of digitalization, challenges mainly concern the provision, delivery and internalization of digital learning and teaching. In this regard, universities have to advance their core competencies from analog to digital provision of knowledge. Hence, it is fundamental for universities to establish a need-based digitalization strategy in order to target the diverse and complementary needs of student and lecturers.

From our ODI study at RWTH Aachen University we could derive a need-based digitalization strategy based on a blended learning concept, which merge traditional/analog with digital learning and teaching concepts. The key action points of the strategy are based on interactive support and encouragement, incentivize and motivation as well as sureness within the learning process. Based on the three core jobs-to-be-done and their underlying needs RWTH is now able to nurture its blended learning strategy for digitalized learning and teaching. Based on the strategic orientation on blended learning and the underlying ODI results, RWTH is capable to make effective user-centric strategic decision according to investments, development and organizational integration of new learning and teaching solutions for higher education.
7 LIMITATION AND FUTURE RESEARCH

From the application we identified some critical issues within the ODI approach. At first, the interview process of collecting the interviews is demanding without any professional experience in the investigated field. Even though the literature on the ODI method is providing the interviewer more insights in how to accomplish the interview process but not about how to avoid misleading conclusions ([40]; [31]). Secondly, the step of converting the outcomes of interviews into the panel statements is critical, since it is partly subjective. For instance, which outcomes are summarized and which outcomes are not being considered is depending on the interviewer and his decision.

Regarding the opportunity equation and algorithm Pinegar [31] has noticed, “when satisfaction is subtracted from importance; this is like subtracting apples from broccoli” and therefore problematic to interpret. In addition, he noticed that according to Maslow’s Theory of the Hierarchy of Needs importance and satisfaction are inversely correlated variables ([31]; [36]). This might result in an evaluation where “people are satisfied with a particular outcome tend to rate that outcome as unimportant, whereas unsatisfied outcomes continue to be rated as important” [31]. However, Pinegar [31] concluded after several simulations of the opportunity equation and algorithm that “the formula has the effect of suppressing the opportunity ratings of truly unimportant outcomes while preserving high opportunity ratings for truly important outcomes and those that are correlated with satisfaction, which is the desired behavior for the algorithm”. After a critical review of the book and its mythology, Pinegar [31] recommends the ODI for product development and therefore innovation projects overall.

In the present case, the application of ODI analysis shows consistent result by the identification of hidden innovation potential within the identified opportunity clusters of higher education. However, this methodology has only applied to one ODI study in higher education so far. Therefore, we recommend to further investigate the performance of the introduced methodology by a demonstration and evaluation with other ODI studies at other universities and business schools. In addition, potential improvements by modifying assumptions and parameters, especially for the quantitative part, could result in a more enhanced methodology.

REFERENCES


[16] Innovative University: Changing the DNA of Higher Education from the inside Out.


